

## DESCRIPTION

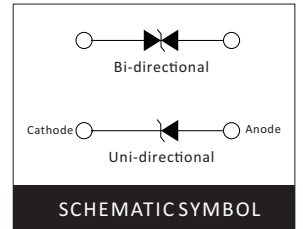
The SMBJ series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events.

## FEATURES

- > Low profile package
- > Ideal for automated placement
- > Available in uni-directional and Bi-directional
- > 600W peak pulse power capability with a 10/1000  $\mu$ s waveform
- > For surface mounted applications to optimize board space
- > Excellent clamping capability
- > Very fast response time
- > Low incremental surge resistance

## APPLICATIONS

TVS devices are ideal for the protection of I/O Interfaces, VCC bus and other vulnerable circuits used in Telecom, Computer, Industrial and Consumer electronic applications.



## MAXIMUM RATINGS AND CHARACTERISTICS Ratings at 25 °C ambient temperature unless otherwise specified.

| RATING  | SYMBOL             | VALUE     | UNITS |
|---|--------------------|-----------|-------|
| Peak Pulse Power Dissipation on 10/1000us waveform (Note1,Note2).   | PPPM               | 600       | Watts |
| Peak Pulse Current of on 10/1000us waveform(Note1).   | IPPM               | See Table | Amps  |
| Steady State Power Dissipation at T <sub>A</sub> =50°C (Note2).   | P <sub>M(AV)</sub> | 5.0       | Watts |
| Maximum Instantaneous Forward Voltage at 50A for Unidirectional Only (Note 4 )                              | V <sub>F</sub>     | 3.5/5.0   | Volts |
| Peak Forward Surge Current,8.3ms Single Half Sine-Wave Superimposed on Rated Load, (JEDEC Method) (Note 3). | I <sub>FSM</sub>   | 100       | Amps  |
| <b>NOTES:</b>   |                    |           |       |
| 1. Non-repetitive current pulse, T <sub>A</sub> = 25°C.   |                    |           |       |
| 2. Mounted on 5.0mm x 5.0mm (0.03mm thick) Copper Pads to each terminal.                                    |                    |           |       |
| 3. 8.3ms single half sine-wave, or equivalent square wave, Duty cycle=4 pulses per minutes maximum.         |                    |           |       |
| 4. V <sub>F</sub> <3.5V for V <sub>BR</sub> ≤ 200V and V <sub>F</sub> <5.0V for V <sub>BR</sub> ≥ 201V.     |                    |           |       |

## THERMAL CONSIDERATIONS

| Symbol           | Parameter                              | Value       | Unit |
|------------------|--|-------------|------|
| T <sub>J</sub>   | Operating Junction Temperature         | -55 to +125 | °C   |
| T <sub>STG</sub> | Storage Temperature Range              | -55to +150  | °C   |
| R <sub>θJA</sub> | Junction to Ambient on Printed Circuit | 90          | °C/W |



### ELECTRICAL CHARACTERISTICS

| Part Number |           | Device Marking Code |    | Reverse Stand-off Voltage | Breakdown Voltage Min.@IT | Breakdown Voltage Max.@IT | Test Current | Maximum Clamping Voltage @IPP | Peak Pulse Current | Reverse Leakage @VRWM |
|-------------|-----------|---------------------|----|---------------------------|---------------------------|---------------------------|--------------|-------------------------------|--------------------|-----------------------|
| UNI         | BI        | UNI                 | BI | VRWM(V)                   | VBR (V)                   | VBR (V)                   | IT(mA)       | Vc(V)                         | IPP(A)             | IR(uA)                |
| SMBJ5.0A    | SMBJ5.0CA | KE                  | AE | 5.0                       | 6.40                      | 7.00                      | 10           | 9.2                           | 65.3               | 800                   |
| SMBJ6.0A    | SMBJ6.0CA | KG                  | AG | 6.0                       | 6.67                      | 7.37                      | 10           | 10.3                          | 58.3               | 800                   |
| SMBJ6.5A    | SMBJ6.5CA | KK                  | AK | 6.5                       | 7.22                      | 7.98                      | 10           | 11.2                          | 53.6               | 500                   |
| SMBJ7.0A    | SMBJ7.0CA | KM                  | AM | 7.0                       | 7.78                      | 8.60                      | 10           | 12.0                          | 50.0               | 200                   |
| SMBJ7.5A    | SMBJ7.5CA | KP                  | AP | 7.5                       | 8.33                      | 9.21                      | 1            | 12.9                          | 46.6               | 100                   |
| SMBJ8.0A    | SMBJ8.0CA | KR                  | AR | 8.0                       | 8.89                      | 9.83                      | 1            | 13.6                          | 44.2               | 50                    |
| SMBJ8.5A    | SMBJ8.5CA | KT                  | AT | 8.5                       | 9.44                      | 10.4                      | 1            | 14.4                          | 41.7               | 20                    |
| SMBJ9.0A    | SMBJ9.0CA | KV                  | AV | 9.0                       | 10.0                      | 11.1                      | 1            | 15.4                          | 39.0               | 10                    |
| SMBJ10A     | SMBJ10CA  | KX                  | AX | 10                        | 11.1                      | 12.3                      | 1            | 17.0                          | 35.3               | 5                     |
| SMBJ11A     | SMBJ11CA  | KZ                  | AZ | 11                        | 12.2                      | 13.5                      | 1            | 18.2                          | 33.0               | 1                     |
| SMBJ12A     | SMBJ12CA  | LE                  | BE | 12                        | 13.3                      | 14.7                      | 1            | 19.9                          | 30.2               | 1                     |
| SMBJ13A     | SMBJ13CA  | LG                  | BG | 13                        | 14.4                      | 15.9                      | 1            | 21.5                          | 28.0               | 1                     |
| SMBJ14A     | SMBJ14CA  | LK                  | BK | 14                        | 15.6                      | 17.2                      | 1            | 23.2                          | 25.9               | 1                     |
| SMBJ15A     | SMBJ15CA  | LM                  | BM | 15                        | 16.7                      | 18.5                      | 1            | 24.4                          | 24.6               | 1                     |
| SMBJ16A     | SMBJ16CA  | LP                  | BP | 16                        | 17.8                      | 19.7                      | 1            | 26.0                          | 23.1               | 1                     |
| SMBJ17A     | SMBJ17CA  | LR                  | BR | 17                        | 18.9                      | 20.9                      | 1            | 27.6                          | 21.8               | 1                     |
| SMBJ18A     | SMBJ18CA  | LT                  | BT | 18                        | 20.0                      | 22.1                      | 1            | 29.2                          | 20.6               | 1                     |
| SMBJ20A     | SMBJ20CA  | LV                  | BV | 20                        | 22.2                      | 24.5                      | 1            | 32.4                          | 18.6               | 1                     |
| SMBJ22A     | SMBJ22CA  | LX                  | BX | 22                        | 24.4                      | 26.9                      | 1            | 35.5                          | 16.9               | 1                     |
| SMBJ24A     | SMBJ24CA  | LZ                  | BZ | 24                        | 26.7                      | 29.5                      | 1            | 38.9                          | 15.5               | 1                     |
| SMBJ26A     | SMBJ26CA  | ME                  | CE | 26                        | 28.9                      | 31.9                      | 1            | 42.1                          | 14.3               | 1                     |
| SMBJ28A     | SMBJ28CA  | MG                  | CG | 28                        | 31.1                      | 34.4                      | 1            | 45.4                          | 13.3               | 1                     |
| SMBJ30A     | SMBJ30CA  | MK                  | CK | 30                        | 33.3                      | 36.8                      | 1            | 48.4                          | 12.4               | 1                     |
| SMBJ33A     | SMBJ33CA  | MM                  | CM | 33                        | 36.7                      | 40.6                      | 1            | 53.3                          | 11.3               | 1                     |
| SMBJ36A     | SMBJ36CA  | MP                  | CP | 36                        | 40.0                      | 44.2                      | 1            | 58.1                          | 10.4               | 1                     |
| SMBJ40A     | SMBJ40CA  | MR                  | CR | 40                        | 44.4                      | 49.1                      | 1            | 64.5                          | 9.3                | 1                     |
| SMBJ43A     | SMBJ43CA  | MT                  | CT | 43                        | 47.8                      | 52.8                      | 1            | 69.4                          | 8.7                | 1                     |
| SMBJ45A     | SMBJ45CA  | MV                  | CV | 45                        | 50.0                      | 55.3                      | 1            | 72.7                          | 8.3                | 1                     |
| SMBJ48A     | SMBJ48CA  | MX                  | CX | 48                        | 53.3                      | 58.9                      | 1            | 77.4                          | 7.8                | 1                     |
| SMBJ51A     | SMBJ51CA  | MZ                  | CZ | 51                        | 56.7                      | 62.7                      | 1            | 82.4                          | 7.3                | 1                     |
| SMBJ54A     | SMBJ54CA  | NE                  | DE | 54                        | 60.0                      | 66.3                      | 1            | 87.1                          | 6.9                | 1                     |



## ELECTRICAL CHARACTERISTICS

| Part Number |           | Device Marking Code |    | Reverse Stand-off Voltage | Breakdown Voltage Min.@IT | Breakdown Voltage Max.@IT | Test Current | Maximum Clamping Voltage @IPP | Peak Pulse Current | Reverse Leakage @VRWM |
|-------------|-----------|---------------------|----|---------------------------|---------------------------|---------------------------|--------------|-------------------------------|--------------------|-----------------------|
| UNI         | BI        | UNI                 | BI | VRWM(V)                   | VBR (V)                   | VBR (V)                   | IT(mA)       | Vc(V)                         | IPP(A)             | IR(uA)                |
| SMBJ58A     | SMBJ58CA  | NG                  | DG | 58                        | 64.4                      | 71.2                      | 1            | 93.6                          | 6.5                | 1                     |
| SMBJ60A     | SMBJ60CA  | NK                  | DK | 60                        | 66.7                      | 73.7                      | 1            | 96.8                          | 6.2                | 1                     |
| SMBJ64A     | SMBJ64CA  | NM                  | DM | 64                        | 71.1                      | 78.6                      | 1            | 103                           | 5.9                | 1                     |
| SMBJ70A     | SMBJ70CA  | NP                  | DP | 70                        | 77.8                      | 86.0                      | 1            | 113                           | 5.3                | 1                     |
| SMBJ75A     | SMBJ75CA  | NR                  | DR | 75                        | 83.3                      | 92.1                      | 1            | 121                           | 5.0                | 1                     |
| SMBJ78A     | SMBJ78CA  | NT                  | DT | 78                        | 86.7                      | 95.8                      | 1            | 126                           | 4.8                | 1                     |
| SMBJ85A     | SMBJ85CA  | NV                  | DV | 85                        | 94.4                      | 104                       | 1            | 137                           | 4.4                | 1                     |
| SMBJ90A     | SMBJ90CA  | NX                  | DX | 90                        | 100                       | 111                       | 1            | 146                           | 4.1                | 1                     |
| SMBJ100A    | SMBJ100CA | NZ                  | DZ | 100                       | 111                       | 123                       | 1            | 162                           | 3.7                | 1                     |
| SMBJ110A    | SMBJ110CA | PE                  | EE | 110                       | 122                       | 135                       | 1            | 177                           | 3.4                | 1                     |
| SMBJ120A    | SMBJ120CA | PG                  | EG | 120                       | 133                       | 147                       | 1            | 193                           | 3.1                | 1                     |
| SMBJ130A    | SMBJ130CA | PK                  | EK | 130                       | 144                       | 159                       | 1            | 209                           | 2.9                | 1                     |
| SMBJ150A    | SMBJ150CA | PM                  | EM | 150                       | 167                       | 185                       | 1            | 243                           | 2.5                | 1                     |
| SMBJ160A    | SMBJ160CA | PP                  | EP | 160                       | 178                       | 197                       | 1            | 259                           | 2.3                | 1                     |
| SMBJ170A    | SMBJ170CA | PR                  | ER | 170                       | 189                       | 209                       | 1            | 275                           | 2.2                | 1                     |
| SMBJ180A    | SMBJ180CA | PT                  | ET | 180                       | 201                       | 222                       | 1            | 292                           | 2.1                | 1                     |
| SMBJ200A    | SMBJ200CA | PV                  | EV | 200                       | 224                       | 247                       | 1            | 324                           | 1.9                | 1                     |
| SMBJ220A    | SMBJ220CA | PX                  | EX | 220                       | 246                       | 272                       | 1            | 356                           | 1.7                | 1                     |
| SMBJ250A    | SMBJ250CA | PZ                  | EZ | 250                       | 279                       | 309                       | 1            | 405                           | 1.5                | 1                     |
| SMBJ300A    | SMBJ300CA | QE                  | FE | 300                       | 335                       | 371                       | 1            | 486                           | 1.3                | 1                     |
| SMBJ350A    | SMBJ350CA | QG                  | FG | 350                       | 391                       | 432                       | 1            | 567                           | 1.1                | 1                     |
| SMBJ400A    | SMBJ400CA | QK                  | FK | 400                       | 447                       | 494                       | 1            | 648                           | 0.9                | 1                     |
| SMBJ440A    | SMBJ440CA | QM                  | FM | 440                       | 492                       | 543                       | 1            | 713                           | 0.9                | 1                     |



RATINGS AND CHARACTERISTIC CURVES ( $T_A=25^\circ\text{C}$  unless otherwise noted)

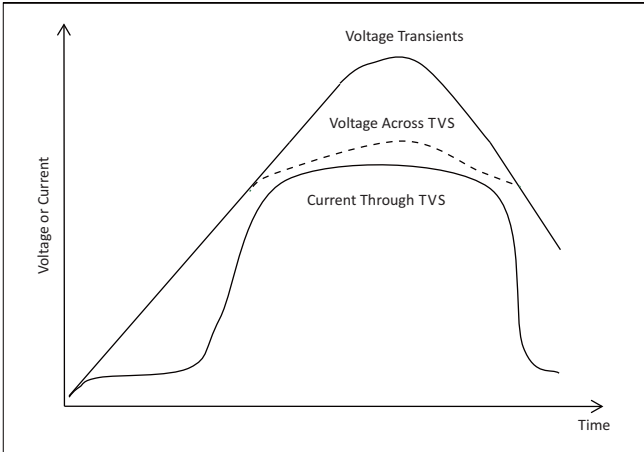


Figure 1 - TVS Transients Clamping Waveform

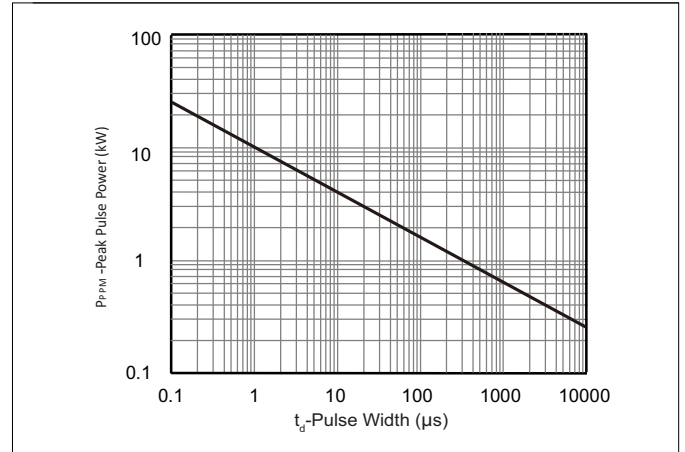


Figure 2 - Peak Pulse Power Rating Curve

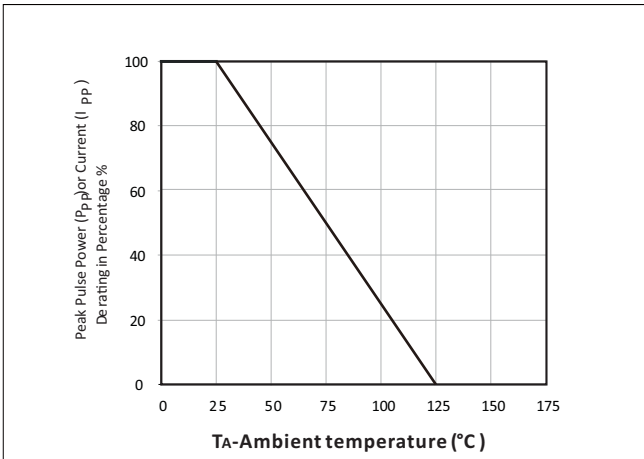


Figure 3 - Pulse Derating Curve

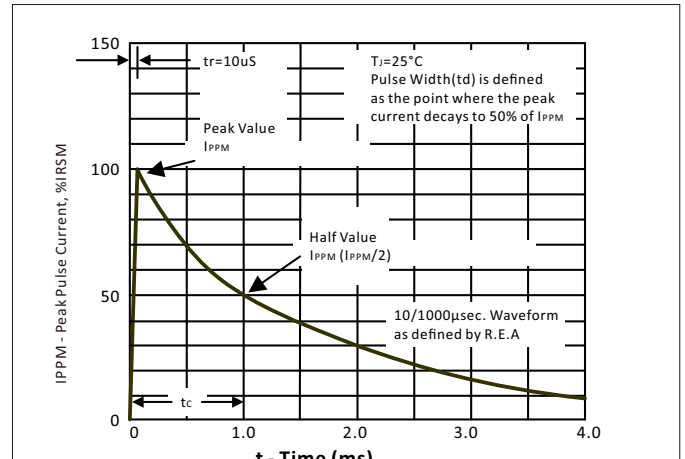


Figure 4. Pulse Waveform

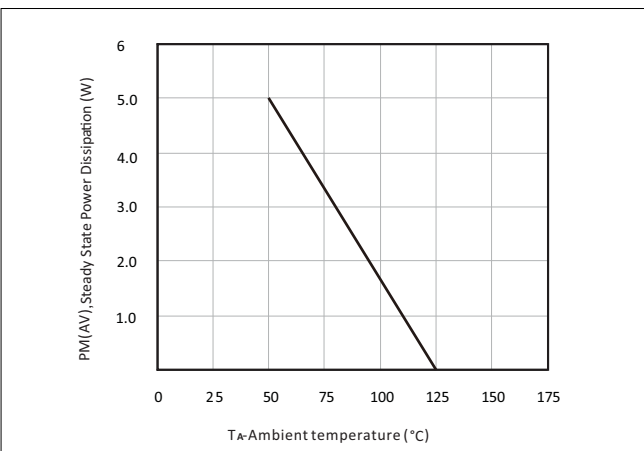


Figure 5 - Steady State Power Dissipation Derating Curve

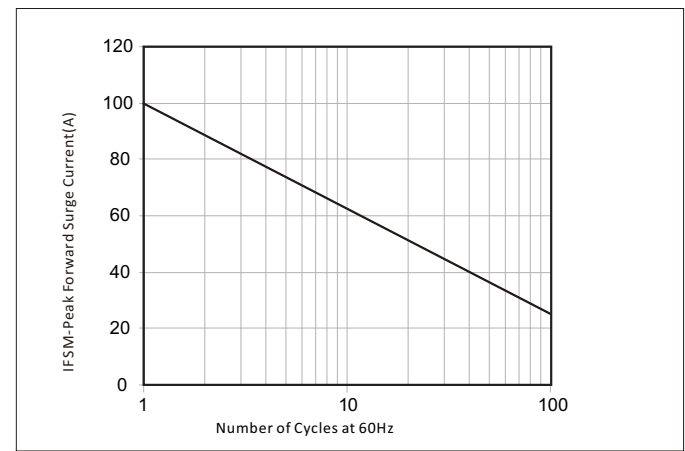
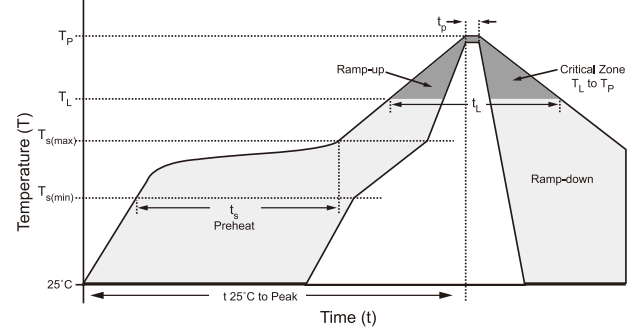


Figure 6. Maximum Non-Repetitive Forward Surge Current Uni-Directional Only

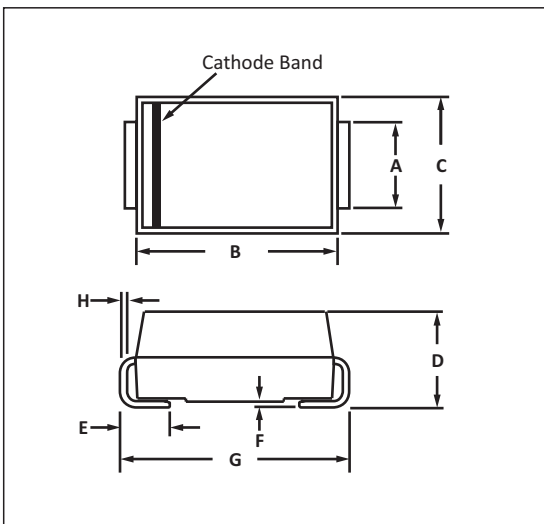


### SOLDERING PARAMETERS

| Reflow Condition                                  |                             | Lead-free assembly |
|---|-----------------------------|--------------------|
| Pre Heat  | Temperature Min (Ts(min))   | 150°C              |
|   | Temperature Max (Ts(max))   | 200°C              |
|   | Time (min to max) (ts)      | 60 – 180 secs      |
| Average ramp up rate (Liquidus Temp (TL) to peak) |                             | 3°C/second max     |
| Ts(max)to TL - Ramp-up Rate                       |                             | 3°C/second max     |
| Reflow  | Temperature (TL) (Liquidus) | 217°C              |
|   | Time (min to max) (tl)      | 60 – 150 seconds   |
| Peak Temperature (TP)                             |                             | 260°C              |
| Time within 5°C of actual peak Temperature (tp)   |                             | 20 – 40 seconds    |
| Ramp-down Rate                                    |                             | 6°C/second max     |
| Time 25°C to peak Temperature (TP)                |                             | 8 minutes Max.     |
| Do not exceed                                     |                             | 260°C              |



### DO-214AA(SMB) PACKAGE DIMENSIONS

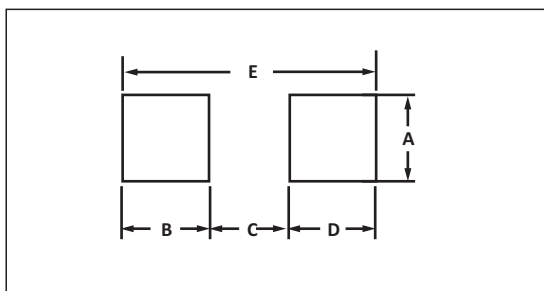


| SMB PACKAGE DIMENSIONS |             |      |        |       |
|------------------------|-------------|------|--------|-------|
| DIM                    | MILLIMETERS |      | INCHES |       |
|                        | MIN         | MAX  | MIN    | MAX   |
| A                      | 1.96        | 2.20 | 0.077  | 0.087 |
| B                      | 4.35        | 4.85 | 0.171  | 0.191 |
| C                      | 3.30        | 3.94 | 0.130  | 0.155 |
| D                      | 2.20        | 2.50 | 0.087  | 0.098 |
| E                      | 0.76        | 1.52 | 0.030  | 0.060 |
| F                      | 0.02        | 0.20 | 0.001  | 0.008 |
| G                      | 5.08        | 5.59 | 0.200  | 0.220 |
| H                      | 0.15        | 0.30 | 0.006  | 0.012 |

**NOTES:**

- Dimensions are exclusive of mold flash and metal burrs
- Cathode Band is only applicable to the unidirectional package

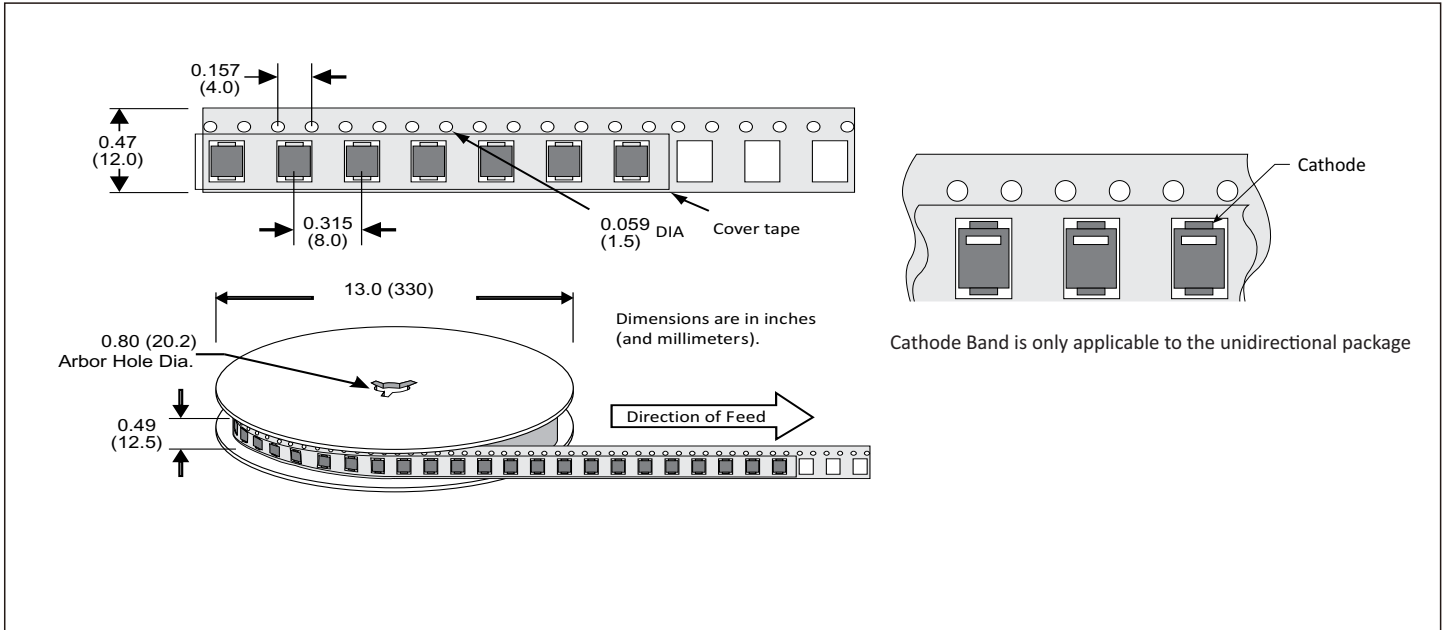
### RECOMMENDED PAD LAYOUT DIMENSIONS



| RECOMMENDED PAD LAYOUT DIMENSIONS |             |      |           |       |
|-----------------------------------|-------------|------|-----------|-------|
| DIM                               | MILLIMETERS |      | INCHES    |       |
|                                   | MIN         | MAX  | MIN       | MAX   |
| A                                 | 2.20        | -    | 0.087     | -     |
| B                                 | 1.45        | -    | 0.057     | -     |
| C                                 | -           | 2.55 | -         | 0.100 |
| D                                 | 1.45        | -    | 0.057     | -     |
| E                                 | 5.60 REF    |      | 0.220 REF |       |



**TAPE AND REEL SPECIFICATION**



**ORDERING INFORMATION**

| Part Number | Component Package | QTY/Reel | Reel Size |
|-------------|-------------------|----------|-----------|
| SMBJxx(C)A  | DO-214AA(SMB)     | 3000PCS  | 13"       |



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